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DEVELOPMENT OF A DATA MANAGEMENT
FRONT END FOR USE WITH A
LANDSAT BASED INFORMATION SYSTEM

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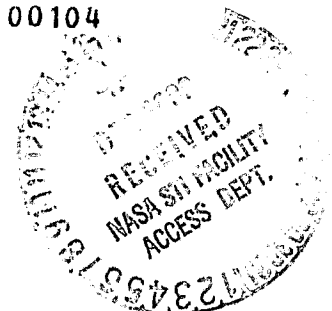
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INTRODUCTION

The Forest Pest Management Division (FPMD) of the Pennsylvania Bureau of Forestry has the responsibility for conducting annual surveys of the State's forest lands to accurately detect, map, and appraise forest insect infestations. This has proven to be an overwhelming and impractical task using current methods, which primarily consist of aerial sketch mapping and ground observations. Nevertheless, these surveys are vital to provide the spatial information needed to plan, organize, direct, and carry out control measures. These measures include the optimum use and allocation of pesticides and the introduction of natural predators.

A standardized, timely, and cost-effective method of accurately surveying forests and their condition should enhance the probability of suppressing infestations. The repetitive and synoptic coverage provided by Landsat (formerly ERTS) makes such satellite-derived data potentially attractive as a survey medium for monitoring forest insect damage over large areas. Forest Pest Management Division personnel have expressed keen interest in Landsat data and have informally cooperated with NASA/Goddard Space Flight Center (GSFC) since 1976 in the development of techniques to facilitate their use. The results of this work indicate that it may be feasible to use Landsat digital data to conduct annual surveys of insect defoliation of hardwood forests.

Since the first Landsat data for Pennsylvania became available in 1972, it has been apparent that large contiguous areas of heavy gypsy moth defoliation could be identified and mapped from satellite passes made in late June or early July. In fact, Mr. Darrel Williams, working with the Office for Remote Sensing of Earth Resources (ORSER) was granted a Master of Science degree at The Pennsylvania State University in 1974 with a thesis entitled, "Computer Analysis and Mapping of Gypsy Moth Defoliation Levels in Pennsylvania Using ERTS-1 Data." Further research by Mr. Williams at GSFC and by Dr. Brian Turner at ORSER indicated however, that if this technology was to reach an operational stage where the whole state could be scanned for accurate identification of defoliated areas, considerable gains in efficiency of computer processing and reductions in cost would be necessary.

A three-stage, three-year project was thus instituted by NASA, to see whether these gains could be achieved. The specific objectives of this project were as follows:

1. To demonstrate the feasibility of conducting automated, annual assessments of the acreage and severity of insect defoliation of hardwood forests using Landsat digital data.
2. To evaluate the accuracy, timeliness and cost-effectiveness of using the automated, Landsat-based survey approach, and to compare these methods with current survey techniques.
3. To provide FPMD personnel with training and experience in the analysis of remote sensing data.

4. To assist ORSER in the development and implementation of computer software to facilitate:
 - a. ingestion and analysis of entire Landsat scenes, and
 - b. summarization of classification results for any given shape or size polygon (i.e., county or district boundaries) within a scene.

The project is being conducted in three phases:

- I. A preliminary testing, training, and development phase conducted within at least two county-wide study areas.
- II. A quasi-operational testing phase, operating within the framework of entire Landsat scenes.
- III. A functional technology transfer phase.

Phase I, the preliminary test phase, was designed to demonstrate the practicality and accuracy of estimating the acreage and severity of defoliation using Landsat digital data and computer processing techniques. The primary objectives of Phase I were as follows:

1. To evaluate the accuracy, timeliness and cost effectiveness of assessing defoliation damage using Landsat data in comparison to the survey techniques currently used by the FPMD.
2. To define the Landsat-based analysis techniques to meet FPMD requirements.
3. To provide training to FPMD personnel relative to the digital analysis of remote sensing data.
4. To initiate the development and implementation of computer software on The Pennsylvania State University computers in order to upgrade the ORSER digital image analysis package to allow both the processing of entire Landsat scenes and the tabulation of classification results for any irregular-shaped polygonal area within a scene.

Under a previous contract with GSFC (NAS5-26166), ORSER implemented the fourth objective of Phase I. The requirements of this contract were as follows:

1. To initiate the development and implementation of computer software on the Pennsylvania State University computers in order to upgrade the ORSER digital image analysis package to allow both the processing of entire Landsat scenes and the tabulation of classification results for any irregular-shaped polygon within that scene.
2. To examine the feasibility of developing a data base/information system to incorporate Landsat and ancillary data covering the entire state of Pennsylvania.

Under this contract and subsequent to it, almost all the programs in the ORSER system were modified to process full Landsat scenes in one pass. Through the development of a system for digitizing polygons, editing them and converting them to raster form, and the use of the existing MAPCOMP program, the ORSER system can now tabulate classification statistics for any irregularly-shaped polygon within a scene.

Also under this contract, the feasibility of developing a data base/information system to incorporate Landsat data and ancillary data for the entire state of Pennsylvania was examined. This resulted in the conceptualization of an interface between the ORSER system and general purpose geographic data analysis systems. It was demonstrated that such a system was feasible, and no major hindrances to the development of such a system in the next phase of this project were foreseen.

Phase II was designed to expand upon the Phase I effort by operating within the framework of entire Landsat scenes. The primary objectives of Phase II were as follows:

1. To test and evaluate the computer software which was developed by ORSER during Phase I.
2. To initiate the development of a data base/information system to handle Landsat data for the entire state of Pennsylvania.
3. To conduct a quasi-operational assessment of gypsy moth defoliation damage using Landsat data.
4. To provide additional training to FPMD personnel relative to digital analysis of remote sensing data.

Initial Phase II activities were to include the testing and evaluation of ORSER computer software to provide efficient methods of:

- a. processing the large amounts of data associated with an entire Landsat scene;
- b. digitizing, entering, and registering to Landsat data, the boundaries for all Pennsylvania counties and/or DFPM districts located wholly or partially within a Landsat scene; and
- c. summarizing classification results, such as total forested acreage or the location, amount, and severity of defoliation, by county or district.

During Phase II, GSFC was to acquire imagery and computer-compatible tapes for the most recent, nondefoliated, and relatively cloud-free Landsat coverage of the entire state of Pennsylvania. These data were to be classified to create a forest/non-forest data base for the entire state.

Classification of Landsat data covering an area as extensive as Pennsylvania requires convenient methods for handling large data sets. Therefore, the development of a data base/information system was to be initiated to

facilitate the forest/non-forest classification of Pennsylvania. This system was to include scene-to-scene registration, sampling methods to select areas for intensive study, and methods of data reduction. In addition, the data base was to contain FPMD boundaries and county boundaries. The total requirements of such a data base/information system were to be determined jointly by FPMD, NASA, and ORSER personnel. The development and implementation of the data base/information system was to be carried out by ORSER, with NASA's assistance.

OBJECTIVE AND SPECIFIC TASKS

The objective of the contract between GSFC and ORSER was to implement those parts of Phase II related to ORSER's involvement in this project, viz., to initiate the development and implementation of a data management front-end system on the Pennsylvania State University computers for use with a Landsat based information system and to facilitate the processing of both Landsat and ancillary data using this system. To attain this objective, ORSER was to develop software and expand its system by means of the specific tasks described below.

A data management front-end system was to be developed which would permit access to a data base system which incorporates Landsat data and ancillary data covering the entire state of Pennsylvania. This front end was to be a cellular grid system that would be compatible with the Pennsylvania FPMD's Forest Pest Locator Grid. In addition, county-wide and division-wide data were to be extractible using the data management system.

The three elements of the data management front-end system that were to be addressed during this contract were:

- a. polygon-to-grid conversion techniques,
- b. registration techniques, and
- c. archival and retrieval techniques.

Digital tapes containing Pennsylvania county and forest district boundaries would be made available to ORSER by GSFC personnel. These were to constitute the initial input to the data base system. Existing University polygon-to-grid conversion software packages would be modified to be compatible with the data management system.

The Jet Propulsion Laboratory would develop a map-projected Landsat Mosaic for the state of Pennsylvania. This would serve as the initial data base for the state. New images could be continually registered to this data base. Computer compatible tapes containing the data base would be made available to ORSER. Because JPL had already developed the registration capability, ORSER was not to be obligated to do so under this contract. However, contract personnel were periodically to consult with JPL to initiate systems integration support at ORSER.

The most critical and extensive procedures to be developed under this contract would be the archival and retrieval techniques. Data would be stored in units that were compatible with the Pennsylvania Forest Locator Grid. The capability would exist to extract this information within county boundaries, forest district boundaries, and locator grid units. The front-end system would consist of a "set-up" index containing look-up tables, a catalog of ORSER job controls, and a series of prompts for the user. The system would be compatible with the remote terminal system, the University INTERACT system, and with the ORSER processors.

It was further specified that the following demonstrations be carried out at specified times during the contract.

1. During the first month: Classification of a full Landsat scene; identification of areas of healthy forest, moderate defoliation, and heavy defoliation, using procedures outlined during Phase I of the project.
2. During the sixth month: Classification of a selected county-wide area located within a single scene; identification of areas of healthy forest, moderate defoliation, and heavy defoliation. A county-wide area would be extracted using techniques developed during this contract.
3. During the twelfth month: Classification of a selected county-wide area located within two Landsat scenes; identification of areas of healthy forest, moderate defoliation, and heavy defoliation. A county-wide area would be extracted using techniques developed during this contract.

OVERVIEW OF ACCOMPLISHMENTS

As the project unfolded, and as a result of meetings at GSFC and at JPL, the following tasks were defined and then accomplished. These are briefly described here and amplified in the following sections.

MASK Program

The new program called MASK is used to mask a raw data set with a character map and produce another raw data set, where some of the pixels have been replaced with all zeros. This program has a wide variety of applications, but in the context of this project it will be used to mask out non-forest pixels prior to classification of the forested areas. This will avoid confusion between agricultural-cleared areas and heavily defoliated forest. This program is more fully described in the current ORSER manual.¹

Versatec Programs

A 22-inch Versatec 8222 electrostatic plotter, financed partly under this contract and partly by University funds, was installed in September 1981 at the PSU Computation Center. Software to make effective use of this major enhancement of our display capabilities has been written in the form of four programs: one to handle raw data in one-line-per-record format, one to produce maps from a specified channel of ORSER-format raw data, one which is a Versatec-output version of NMAP (called NMAPV, described elsewhere in more detail), and one which is a Versatec-output version of DISPLAY (called DISPLAYV).

Pennsylvania Data Base

The data base of the western half of Pennsylvania was received from JPL in October, 1981. This was supplied as four irregular polygons in band-sequential format. Three programs (SEW, INT, and DBGEN) were written to edge-join the polygons and reformat the data into the ORSER Data Base format (described elsewhere). A special version of the ORSER SUBOUND program, called SUBDB, was written to accept a set of line-element coordinates defining an irregular polygon which bounds data in the Data Base format and outputs raw data, for the bounded area only, in the regular ORSER Raw Data format.

Another program, PIOS, was required to extract the UTM coordinates of the counties and forest districts, as supplied on tape from GSFC, convert them to line-element coordinates corresponding with the data base, and produce AREA cards for input to the SUBDB program.

Data Base Front-End

A user-friendly system has been set up using the INTERACT EXEC-file feature available at the University to allow a non-programmer to develop the

¹Turner, B. J., G. M. Baumer, and W. L. Myers (1982). The ORSER Remote Sensing Analysis System: A User's Manual. Research Publication 109/OR, Institute for Research on Land and Water Resources, The Pennsylvania State University.

job for extracting a specified section of the data base and then process it using the front-end for the ORSER system. The user conversationally requests counties, forest districts, Pest Locator Grid units, or quad sheets, then gives the name or code of the requested area. The EXEC program locates the requested boundary and sets up a SUBDB job for execution.

Interfacing Remotely Sensed Data
to Geographic Data Base Systems

Partly under this project, a system of programs is being developed to summarize categorized Landsat-derived data by grid cells and add these statistics as layers to an existing geographic data base. Although not specifically required by the contract, this is an important step in interfacing the Landsat-derived Pennsylvania data base with existing statewide geographic data bases, such as the LUDA system.

SOFTWARE DEVELOPED UNDER CONTRACT

The ORSER Data Base Concept

The Pennsylvania data base consists of two mosaics of Landsat data, one covering the eastern half and one covering the western half of the state. Each mosaic lies in a separate UTM zone. The western half of the data base consists of 6000 scan lines, each of which has 5500 elements and 4 bands for each element. This adds up to 142-million bytes of information for the western half alone. In order to handle this amount of information efficiently, a new format had to be invented that allowed easy access to all 4 bands of the data base for any irregular area. Such an area might be a county, a forest district, or any user-identified area, defined either by line-element numbers or UTM coordinates. This new format is called the ORSER Data Base format.

The ORSER Data Base Format

The ORSER Data Base format is essentially a band-interleaved-by-line format, where all of the pixels for one band of a scan line are stored as one logical record on a tape. Scan lines are organized in ascending order, just as in the ORSER Raw Data format. The scan lines are grouped into tape files containing a specific number of lines. In the case of the western Pennsylvania mosaic, there are 500 scan lines per tape file. Thus, 12 tape files are used for the entire data set. The first file contains all bands for scan lines 1 through 500, the second file contains lines 501 through 1000, and so on, through the last file. Header information on the files is stored within the program so that only files containing data within the area of interest need be read. This was done to cut down on the amount of computer time required to access an area that may be several thousand scan lines down the data base.

Along with the grid cell format described above, the data base consists of sets of coordinates that describe irregular areas. Currently, all of the county boundaries and all of the forest district boundaries are stored as separate tape files. As part of the front-end system, there is an index that relates each county to its corresponding file on the tape. Other boundaries (such as watersheds) can easily be added to the system, as long as the coordinates are in the UTM projection.

The SUBDB Program

The SUBDB program will subset any irregularly bounded area from a data set in the ORSER Data Base format and output the data in the ORSER Raw Data format for subsequent analysis by any of the ORSER programs. The program requires only two tape drives but may use more than two tapes, depending upon the size of the area to be subset.

The SUBDB program first reads the file containing the AREA cards that describe the desired polygon. Optionally, these cards may be entered manually in either UTM meters or line and element numbers. The program then converts these into starting and stopping points within each scan line. It also

computes the maximum and minimum line and element numbers that will be needed for the data. Then SUBDB determines which file in the data base to start with, based on the minimum line number. The program starts with this file directly and processes sequentially from there. The data are then reformatted into the ORSER Raw Data format while replacing all pixels that lie outside the area with all zeros (null pixels). The new data set, now in the ORSER Raw Data format, are written onto the output tape and can then be processed by any program in the ORSER system that processes raw data.

Reformatting Programs for Data Base Generation

Three programs were needed to reformat the data from 16 VICAR files into the ORSER Data Base format. These programs are called SEW, INT and DBGEN. SEW reads up to 4 VICAR format files of adjacent areas and sews them together to form 1 VICAR file. This had to be done for each of the 4 bands. INT reads VICAR-formatted files and produces band-interleaved-by-line files. This program was run on bands 4 and 5 together, then on bands 6 and 7 together. The third program, DBGEN, then reads these 2 files, interleaves them and breaks them down into 12 files of 500 scan lines each. These programs should prove useful in adding to the data base, either in terms of extra bands or adjacent geographic areas.

The NMAPV Program

The NMAPV program is a modification of the NMAP program that will output directly to the Versatec 8222 Electrostatic Printer at the PSU Computation Center. NMAPV works exactly like NMAP, but instead of producing a character line printer map, it produces a grey scale map on the Versatec. The disadvantage of using NMAPV over NMAP is that it requires more core and therefore must be run in a higher category. Thus, turn around time will most likely be longer. The advantages to NMAPV are that it produces a much more readable map and that it can output a width of up to 4200 pixels on one page.

The Versatec is an electrostatic raster printer. That is, it prints tiny dots and produces grey scales by using different groupings of "on-off" dots. For complete descriptions of how the Versatec works, see the "Versatec Programmer's Guide,"² but this manual is not required to successfully use the NMAPV program. Essentially, the user needs to know only the two following facts:

1. The Versatec has a square pixel one two-hundredth of an inch on a side and can print 4200 pixels across the page. Thus, if a map is produced that has 500 lines and 600 elements, it will be 2½" long and 3" wide.
2. The user must specify which grey level to use for each class, by indicating a number from 0 (black) to 255 (white). The default (if no CLASS cards are specified) is to use 8 equally spaced grey levels and put an equal percentage of the data into each of the 8 classes.

²Computation Center (1982). Versatec Programmer's Guide. The Pennsylvania State University.

If the data area is small, the NMAPV program can be run with the default classes. This means that the first 50 lines of data will be used to define 8 uniform percent classes. For a large area, the program should be run first on a smaller block near the middle of the data set. Then, the "one percent classes" table can be used to define appropriate levels for the classes. For display of Landsat data, it seems that 8 to 10 classes yield a map which is as readable as one using 32 classes (the maximum number), at less cost. NMAPV (like NMAP) will display many different maps depending on the options used. Only experimentation can indicate which combination of class cards will best show the desired features for a given data set.

The control cards, listed below, for the NMAPV program, and their defaults, are described in the "Commonly Used Control Cards" writeup in the ORSER manual.

ALL BLOCKS	BLOCK	CHANNELS
COMMENT	END	FLIGHT
LEVEL	TITLE	

The control cards described below work exactly as in NMAP, with the following exceptions:

CLASS Card(s)

<u>Cols.</u>	<u>Description of Contents</u>
1-5	CLASS
8-10	Grey level to be used for this class (000-255)
11-14	Upper level of the class in real format

The CLASS card works as in NMAP, except that instead of a symbol, a 3-digit number is used that must range from 000 (black) to 255 (white).

PCTCLASS Card(s)

The PCTCLASS card works as in NMAP, except that the discussion on symbols does not apply. Instead of symbols, the program will calculate the values of the grey scales to be used as follows: The value for the first percent class will be zero. The value for the next percent class will be the value for the previous one plus $(255/(\text{number of requested classes} - 1))$. In other words, the grey levels will be equally spaced between 0 and 255.

VERSATEC Card

<u>Cols.</u>	<u>Description of Contents</u>
1-8	VERSATEC
10-11	line repetition factor (required)
13-14	element repetition factor (required)
16-18	background level (default = 0, black)

The VERSATEC card is required and must be the first control card read by the program. The line and element repetition factors are used to enlarge the picture. They must both be specified as integers and need not be the same. The only restriction is that the element repetition factor times the number of elements output (calculated from the BLOCK card or by default of the entire map) must be less than or equal to 4200. The background level is the grey level used for null pixels (those outside the bounded area), the default value is 0 (black) but the user may wish to use 255 for a white background. When the VERSATEC card is used, the SYMBOLS card should not be used. Without the VERSATEC card, the program will work like NMAP. All of the associated statistics and summary tables produced by NMAP will also be produced by NMAPV.

The MASK Program

The MASK program is used to mask a raw data set with a character map and produce another raw data set, where some of the pixels have been replaced with all zeros (null pixels). Normally, the pixels whose value is set to null have their corresponding value blank on the character map.

The program has two input data sets. The first must be in the ORSER Raw Data format. The second must be in the ORSER Compressed Map format. Both of these formats are described in the ORSER manual write-up, "ORSER Data Formats." The program reads the raw data of the character map and sets the value in all channels to zero for any pixel having a blank as its value in the character map. It then writes this data set out in the ORSER Raw Data format, which can then be read by any of the ORSER programs that read raw data.

The MASK program allows the user to first classify a data set and then, using a final character map, to mask out all of the data except those belonging to a certain category. The result can then be run through any other ORSER program to further divide that class without confusion with pixels that were classified differently in the first step. The KEEP card can be used to specify the characters to be kept.

This program has a wide variety of different applications. The compressed map used to do the masking need not be generated from the same data set as the one being masked. A compressed map of forest versus non-forest may be generated from one scene, then this map may be used to mask a later scene. The resulting data set can then be analyzed to detect changes in the area that was previously defined as forest. As another example of the flexibility of this program, one might first generate a uniformity map (using the UMAP program) to produce a compressed map of "uniform" areas, and then run the MASK program to produce a data set where the only pixels left are those that show some level of uniformity with their neighbors. This data set can then be run through the CLUS program, for example, to cluster only relatively large areas.

The following control cards for the MASK program, are described in the "Commonly Used Control Cards" writeup in the ORSER manual.

BLOCK

END

MATCH

The FLIGHT card is described in the "SUBSET Program Description." Two other cards can be used in this program.

KEEP Card

<u>Cols.</u>	<u>Description of Contents</u>
1-4	KEEP
9-68	Any Symbols

The KEEP card is used to tell the MASK program which characters to keep, that is, all other characters will be set to zero. If no KEEP card is used, all characters except blank will be kept. This is recommended, since the programs run slightly faster. Any symbols except blank may be kept. If blank is desired, the BLANK card must be used.

BLANK Card

<u>Cols.</u>	<u>Description of Contents</u>
1-5	BLANK
6-80	Not Used

The BLANK card can only be used if a KEEP card is used. If used, it must follow the KEEP card. The BLANK card specifies that the character blank is to be added to the list of characters to be kept as specified on the KEEP card.

CONCLUSION

The objective of the contract, viz., to initiate the development and implementation of a data management front-end system on The Pennsylvania State University computers for use with a Landsat based information system and to facilitate the processing of both Landsat and ancillary data using this system, has been realized.

All the specific tasks have been completed as required. Software has been developed to adapt existing ORSER programs to the peculiar needs of the Landsat mosaic data base supplied by JPL. Archival and retrieval techniques have been developed to efficiently handle this data base and make it compatible with the requirements of the Pennsylvania Bureau of Forestry. A user-friendly front-end has been constructed to facilitate access to the data base.

The specified demonstrations of classification of defoliated forest by various area delineations have not been carried out, by agreement with the Technical Officer of Goddard Space Flight Center. However, everything is now in place to complete the process, as follows:

1. For a specified area, form the forest/non-forest mask in ORSER compressed map format using GSFC-supplied classification procedures.
2. Register data from a new scene (defoliated) to the mask (which may involve mosaicking if the area encompasses two Landsat scenes).
3. Produce a masked new data set using the MASK program.
4. Analyze this data set (using classification methods recommended by GSFC) to produce a map showing degrees of defoliation, output on the Versatec plotter.
5. Produce color composite maps by a diazo-type process.

APPENDIX A: SAMPLE INTERACT SESSION

SAMPLE INTERACT SESSION TO ACCESS THE PENNSYLVANIA DATA BASE

The following example shows how easily the job stem can be set up to subset data from the Pennsylvania Data Base by county, forest district, user-defined polygon, or pest-locator grid.cell. Six sequential computer runs are shown, including five subsets and one run of NMAPV. Output to both disc and tape are shown. Examples of Versatec output for four areas are shown in Appendix B.

```
? exec from men.u41000.gmb.lib#orsergo on vol005 clr
```

WELCOME TO THE ORSER SYSTEM.

OK TO CLEAR ACTIVE FILE? ok

ENTER PROGRAM NAME OR 'HELP' FOR A DETAILED LIST OF INSTRUCTIONS.

ENTER 'LISTTAPES' TO LIST WORKING TAPES (RS TAPES) ASSIGNED TO YOU.

ENTER 'POLYGON' TO EXECUTE ANY ORSER POLYGON PROGRAM.

ENTER 'DATABASE' TO ACCESS THE PENNSYLVANIA LANDSAT DATABASE.

ENTER 'EXIT' TO EXIT THIS EXEC FILE.

-->database

WELCOME TO THE PENNSYLVANIA LANDSAT DATABASE.

LANDSAT DATA CAN BE RETRIEVED BY COUNTY NAME (C) BY FOREST DISTRICT (D),
USER DEFINED POLYGON (U), OR BY PEST LOCATER GRID CELLS (P).

ENTER THE TYPE OF AREA TO BE RETRIEVED (C/D/U/P) OR TYPE 'HELP' FOR
MORE INFORMATION.

-->help

*** THE PENNSYLVANIA LANDSAT DATABASE ***

LANDSAT DATA HAS BEEN COLLECTED, GEOMETRICALLY CORRECTED, AND
SEWN TOGETHER FOR THE STATE OF PENNSYLVANIA. THE DATA IS A COMPOSITE
OF SEVERAL SUMMER PASSES FROM 1976-1979. IT HAS BEEN GEOMETRICALLY
TO UTM COORDINATES AND IS DIVIDED INTO EAST AND WEST SECTIONS
ALONG THE 78TH LONGITUDINAL LINE. THE DATA CAN BE ACCESSED BY FOUR
METHODS: COUNTIES, FOREST DISTRICTS, USER DEFINED POLYGONS, OR
PENNSYLVANIA D.E.R. PEST LOCATER GRID CELLS. MORE DETAILED
DISCRIPTIONS OF THE ACCESS METHODS ARE AVAILABLE BY TYPING 'HELP'
WHEN IN THE DESIRED ACCESSING PORTION OF THIS PROGRAM.

(HIT RETURN TO CONTINUE)

ACCESSING LANDSAT DATA IS STRAIGHT FORWARD USING THIS EXEC FILE. THE
USER SUPPLIES THE DESIRED ACCESS METHOD AT THE FIRST PROMPT
AND IS PROMPTED THROUGH THE SELECTED ACCESS METHOD. AT THE END
OF THE ACCESS SESSION THE USER WILL BE ASKED FOR A TAPE NAME
FOR RECEIVING THE DATA, AND THE JOB STEM WILL BE IN AN ACTIVE
FILE READY FOR SUBMISSION TO THE COMPUTER.

(HIT RETURN TO CONTINUE)

LANDSAT DATA CAN BE RETRIEVED BY COUNTY NAME (C), BY FOREST DISTRICT (D), USER DEFINED POLYGON (U), OR BY PEST LOCATER GRID CELLS (P).
ENTER THE TYPE OF AREA TO BE RETRIEVED (C/D/U/P) OR TYPE 'HELP' FOR MORE INFORMATION.

-->county

*** THE PENNSYLVANIA LANDSAT DATABASE ***

ACCESSING AREA BY COUNTY NAME

ENTER THE COUNTY NAME. ONLY ONE COUNTY CAN BE ACCESSED AT A TIME.
ENTER 'HELP' FOR MORE INFORMATION.

-->help

ACCESSING LANDSAT DATA BY COUNTY

THIS SECTION OF THE DATABASE ALLOWS USERS TO SUBSET THE LANDSAT DATA FOR ONE COUNTY AT A TIME. THE USER WILL BE PROMPTED FOR THE DESIRED COUNTY. THE COUNTY NAME IS ENTERED AND THE PROGRAM CONTINUES UNTIL A JOB STEM IS READY FOR SUBMISSION TO THE COMPUTER. SOME COUNTIES ARE DIVIDED INTO EAST AND WEST SECTIONS. THE USER IS PROMPTED FOR THE DESIRED SECTION.

THE USER IS THEN PROMPTED FOR ADDITIONAL CONTROL CARDS, WHICH WOULD INCLUDE THE FOLLOWING : CHANNELS, END

THE NEXT PROMPT IS FOR AN OUTPUT TAPE TO RECEIVE THE COUNTY DATA, AND FOR JOB OPTIONS. THE JOB STEM IS PLACED IN THE USER'S ACTIVE FILE, READY FOR SUBMISSION TO THE COMPUTER.

ENTER THE COUNTY NAME. ONLY ONE COUNTY CAN BE ACCESSED AT A TIME.
ENTER 'HELP' FOR MORE INFORMATION.

-->center

THE COUNTY SPECIFIED WAS NOT FOUND. PLEASE CHECK TO MAKE SURE THAT

'CENTER'

IS SPELLED CORRECTLY.

THE FOLLOWING COUNTIES BEGIN WITH THE LETTER 'C':

CAMBRIA
CLEARFIELD
CRAWFORD
CLARION
CENTRE
CAMERON
CLINTON
CUMBERLAND
COLUMBIA
CHESTER
CARBON

ENTER THE COUNTY NAME. ONLY ONE COUNTY CAN BE ACCESSED AT A TIME.
ENTER 'HELP' FOR MORE INFORMATION.

-->centre

THE SELECTED COUNTY (CENTRE) IS DIVIDED INTO EAST(E) AND WEST(W) SECTIONS.
ONLY ONE SECTION MAY BE RETRIEVED AT A TIME. PLEASE ENTER THE DESIRED
SECTION(E/W).

-->west

IF ADDITIONAL CONTROL CARDS ARE DESIRED, TYPE CONTROL CARD
NAME OR 'HELP' FOR A LIST OF APPLICABLE CARDS. WHEN ALL DESIRED
CARDS HAVE BEEN INCLUDED, HIT RETURN.

-->help

CONTROL CARDS THAT MAY BE USED WITH THE DATABASE PROGRAM INCLUDE:

CHANNELS

END

ENTER NEXT CONTROL CARD NAME, 'HELP', OR HIT RETURN TO EXIT

-->channels

ENTER DESIRED CHANNEL NUMBERS, ONE PER LINE. WHEN ALL HAVE BEEN
ENTERED, HIT RETURN.

-->1

-->3

-->4

-->

ENTER NEXT CONTROL CARD NAME, 'HELP', OR HIT RETURN TO EXIT

-->

END CARD INCLUDED

GIVE THE OUTPUT SPECIFICATIONS AT THE NEXT PROMPT.

IS OUTPUT ON TAPE OR DISK? (T/D)

-->d

ENTER OUTPUT DATA SET NAME

-->MEN.P92250.FCL.centre.west

ENTER NUMBER OF TRACKS FOR DATA SET

NUMBER OF TRACKS = 1 + (#CHAN * #ELEM * #LINES) / 10000

-->75

* END OF COUNTY ACCESS METHOD *

ENTER JOB PARAMETER OPTION NUMBER(S) OR 'HELP' FOR A LIST
OF OPTIONS. TO EXIT EXEC FILE, HIT RETURN.

-->

** ACTIVE FILE NOW CONTAINS STEM FOR RUNNING THE DATABASE PROGRAM **
FOR INFORMATION ON RUNNING THE PROGRAM, ENTER 'HELP', OR HIT
RETURN TO EXIT.

-->

*** END OF ORSER EXEC FILE ***

? list; list of the active file

```

1. //MN2XXXXX JOB (JCC01),
2. // REGION=500K
3. //***** ORSER SUBDB PROGRAM *****
4. // EXEC PGM=SUBDB
5. /** REFERENCE TO THE ORSER LOAD MODULE LIBRARY
6. //STEPLIB DD DSN=MEN.P92250.PUB.ORLIB,DISP=SHR,
7. // VOL=REF=MEN.P92250.PUB.ORLIB,UNIT=SYSALLDA
8. /** UNIT 6 IS A PRINT FILE
9. //FT06F001 DD SYSOUT=A,DCB=(RECFM=FA,BLKSIZE=133)
10. //FT14F001 DD DSN=MEN.U41000.NBB.OUTPUT.TAPE.CATALOG,DISP=SHR,
11. // VOL=REF=MEN.U41000.NBB.LIB,UNIT=SYSALLDA
12. /*TAPE LIB005
13. /** THE FOLLOWING DD STATEMENTS DESCRIBT THE PA DATA BASE
14. /** WESTERN HALF UTM PROJECTION.
15. //FT51F001 DD UNIT=TAPE,VOL=(,RETAIN,SER=LIB005),
16. // LABEL=1,DSN=DATABASE,DISP=OLD,DCB=(RECFM=U,BLKSIZE=6000)
17. //FT52F001 DD UNIT=TAPE,VOL=(,RETAIN,SER=LIB005),
18. // LABEL=2,DSN=DATABASE,DISP=OLD,DCB=(RECFM=U,BLKSIZE=6000)
19. //FT53F001 DD UNIT=TAPE,VOL=(,RETAIN,SER=LIB005),
20. // LABEL=3,DSN=DATABASE,DISP=OLD,DCB=(RECFM=U,BLKSIZE=6000)
21. //FT54F001 DD UNIT=TAPE,VOL=(,RETAIN,SER=LIB005),
22. // LABEL=4,DSN=DATABASE,DISP=OLD,DCB=(RECFM=U,BLKSIZE=6000)
23. //FT55F001 DD UNIT=TAPE,VOL=(,RETAIN,SER=LIB005),
24. // LABEL=5,DSN=DATABASE,DISP=OLD,DCB=(RECFM=U,BLKSIZE=6000)
25. //FT56F001 DD UNIT=TAPE,VOL=(,RETAIN,SER=LIB005),
26. // LABEL=6,DSN=DATABASE,DISP=OLD,DCB=(RECFM=U,BLKSIZE=6000)
27. //FT57F001 DD UNIT=TAPE,VOL=(,RETAIN,SER=LIB005),
28. // LABEL=7,DSN=DATABASE,DISP=OLD,DCB=(RECFM=U,BLKSIZE=6000)
29. //FT58F001 DD UNIT=TAPE,VOL=(,RETAIN,SER=LIB005),
30. // LABEL=8,DSN=DATABASE,DISP=OLD,DCB=(RECFM=U,BLKSIZE=6000)
31. //FT59F001 DD UNIT=TAPE,VOL=(,RETAIN,SER=LIB005),
32. // LABEL=9,DSN=DATABASE,DISP=OLD,DCB=(RECFM=U,BLKSIZE=6000)
33. //FT60F001 DD UNIT=TAPE,VOL=(,RETAIN,SER=LIB005),
34. // LABEL=10,DSN=DATABASE,DISP=OLD,DCB=(RECFM=U,BLKSIZE=6000)
35. //FT61F001 DD UNIT=TAPE,VOL=(,RETAIN,SER=LIB005),
36. // LABEL=11,DSN=DATABASE,DISP=OLD,DCB=(RECFM=U,BLKSIZE=6000)
37. /** THE FOLLOWING DD STMT. DESCRIBES THE OUTPUT DATA SET
38. //FT09F001 DD DSN=MEN.P92250.FCL.CENTRE.WEST,
39. // VOL=REF=MEN.P92250.FCL.LIB,
40. // DISP=(NEW,KEEP);SPACE=(TRK,(75,1),RLSE),
41. // DCB=(RECFM=VBS,LRECL=18412,BLKSIZE=19050,OPTCD=C)
42. /**
43. //FT05F001 DD DSN=*&CARDS,UNIT=VIO SPACE=(TRK,(1,1),RLSE),
44. // DISP=(NEW,DELETE),DCB=(RECFM=FB,LRECL=80,BLKSIZE=1600)
45. /*TAPE RSWEST
46. //FT04F001 DD UNIT=TAPE,VOL=SER=RSWEST,DSN=CENTREW,
47. // LABEL=17,DCB=(RECFM=FB,LRECL=80,BLKSIZE=3200)
48. // DD *
49. DATABASE
50. CHANNELS 1 3 4
51. END
52. /*

```

? run unn

JOB 2909 MN2FCL03 AW JCL CONVERSION

? exec from men.u41000.gmb.lib#orsergo on vol005 clr

? exec fro \$men.u41000.gmb.lib#orsergo on cat clr

WELCOME TO THE ORSER SYSTEM.

OK TO CLEAR ACTIVE FILE? ok

ENTER PROGRAM NAME OR 'HELP' FOR A DETAILED LIST OF INSTRUCTIONS.

ENTER 'LISTTAPES' TO LIST WORKING TAPES (RS TAPES) ASSIGNED TO YOU.

ENTER 'POLYGON' TO EXECUTE ANY ORSER POLYGON PROGRAM.

ENTER 'EXIT' TO EXIT THIS EXEC FILE.

ENTER 'DATABASE' TO ACCESS THE PENNSYLVANIA LANDSAT DATABASE.

-->database

WELCOME TO THE PENNSYLVANIA LANDSAT DATABASE.

LANDSAT DATA CAN BE RETRIEVED BY COUNTY NAME (C), BY FOREST DISTRICT (D),
USER DEFINED POLYGON (U), OR BY PEST LOCATER GRID CELLS (P).

ENTER THE TYPE OF AREA TO BE RETRIEVED (C/D/U/P) OR TYPE 'HELP' FOR
MORE INFORMATION.

-->c

*** THE PENNSYLVANIA LANDSAT DATABASE ***

ACCESSING AREA BY COUNTY NAME

ENTER THE COUNTY NAME. ONLY ONE COUNTY CAN BE ACCESSED AT A TIME.

ENTER 'HELP' FOR MORE INFORMATION.

-->elk

IS OUTPUT ON TAPE OR DISK? (T/D)

-->t

ENTER LAST NAME AND FIRST INITIAL SEPARATED BY ONE BLANK.

-->baumer g

ENTER OUTPUT TAPE NAME

-->rs0114

1000 COMMANDS EXECUTED WITH NO TYPING -- CHECK FOR LOOP

* END OF COUNTY ACCESS METHOD *

ENTER JOB PARAMETER OPTION NUMBER(S) OR 'HELP' FOR A LIST
OF OPTIONS. TO EXIT EXEC FILE, HIT RETURN.

-->

** ACTIVE FILE NOW CONTAINS STEM FOR RUNNING THE DATABASE PROGRAM **
FOR INFORMATION ON RUNNING THE PROGRAM, ENTER 'HELP', OR HIT
RETURN TO EXIT.

-->

*** END OF ORSER EXEC FILE ***

? exe fro \$men.u41000.gmb.lib#orsergo on cat clr

WELCOME TO THE ORSER SYSTEM.
 OK TO CLEAR ACTIVE FILE? ok
 ENTER PROGRAM NAME OR 'HELP' FOR A DETAILED LIST OF INSTRUCTIONS.
 ENTER 'LISTTAPES' TO LIST WORKING TAPES (RS TAPES) ASSIGNED TO YOU.
 ENTER 'POLYGON' TO EXECUTE ANY ORSER POLYGON PROGRAM.
 ENTER 'DATABASE' TO ACCESS THE PENNSYLVANIA LANDSAT DATABASE.
 ENTER 'EXIT' TO EXIT THIS EXEC FILE.
 -->database

WELCOME TO THE PENNSYLVANIA LANDSAT DATABASE.

LANDSAT DATA CAN BE RETRIEVED BY COUNTY NAME (C), BY FOREST DISTRICT (D),
 USER DEFINED POLYGON (U), OR BY PEST LOCATER GRID CELLS (P).
 ENTER THE TYPE OF AREA TO BE RETRIEVED (C/D/U/P) OR TYPE 'HELP' FOR
 MORE INFORMATION.
 -->d

*** THE PENNSYLVANIA LANDSAT DATABASE ***

ACCESSING AREA BY FOREST DISTRICT

ENTER THE FOREST DISTRICT NUMBER. ONLY ONE DISTRICT CAN BE ACCESSED
 AT A TIME. ENTER 'HELP' FOR MORE INFORMATION.
 -->help

ACCESSING LANDSAT DATA BY FOREST DISTRICTS

THIS SECTION OF THE DATABASE ALLOWS USERS TO SUBSET THE LANDSAT
 DATA FOR ONE OF THE PENNSYLVANIA STATE FOREST DISTRICTS. THE
 USER WILL BE PROMPTED FOR THE DESIRED FOREST DISTRICT. SOME OF
 THE DISTRICTS ARE DIVIDED INTO EAST AND WEST SECTIONS AND THE
 USER WILL BE PROMPTED FOR THE DESIRED SECTION. (THE DISTRICTS ARE
 NUMBERED FROM 1 TO 20)

THE USER IS THEN PROMPTED FOR ADDITIONAL CONTROL CARDS, WHICH
 WOULD INCLUDE THE FOLLOWING : CHANNELS, END

THE USER IS NEXT PROMPTED FOR AN OUTPUT TAPE TO RECEIVE THE FOREST
 DISTRICT DATA, AND FOR JOB OPTIONS. THE JOB STEM IS PLACED IN THE
 USER'S ACTIVE FILE, READY FOR SUBMISSION TO THE COMPUTER.

ENTER THE FOREST DISTRICT NUMBER. ONLY ONE DISTRICT CAN BE ACCESSED
 AT A TIME. ENTER 'HELP' FOR MORE INFORMATION.
 -->13

THE SELECTED DISTRICT (13) IS DIVIDED INTO EAST (E) AND WEST (W)
 SECTIONS. ONLY ONE SECTION MAY BE ACCESSED AT A TIME. PLEASE
 ENTER THE DESIRED SECTION (E/W).
 -->w

IF ADDITIONAL CONTROL CARDS ARE DESIRED, TYPE CONTROL CARD
 NAME OR 'HELP' FOR A LIST OF APPLICABLE CARDS. WHEN ALL DESIRED
 CARDS HAVE BEEN INCLUDED, HIT RETURN.
 -->help

CONTROL CARDS THAT MAY BE USED WITH THE DATABASE PROGRAM INCLUDE:

CHANNELS
END

ENTER NEXT CONTROL CARD NAME, 'HELP', OR HIT RETURN TO EXIT
-->
END CARD INCLUDED

GIVE THE OUTPUT SPECIFICATIONS AT THE NEXT PROMPT.

IS OUTPUT ON TAPE OR DISK? (T/D)
-->d
ENTER OUTPUT DATA SET NAME
-->MEN.P92250.FCL.forest.dist13.wast
ENTER NUMBER OF TRACKS FOR DATA SET
NUMBER OF TRACKS = 1 + (#CHAN * #ELEM * #LINES) / 10000
-->60

* END OF DISTRICT ACCESS METHOD *

ENTER JOB PARAMETER OPTION NUMBER(S) OR 'HELP' FOR A LIST
OF OPTIONS. TO EXIT EXEC FILE, HIT RETURN.
-->

** ACTIVE FILE NOW CONTAINS STEM FOR RUNNING THE DATABASE PROGRAM **
FOR INFORMATION ON RUNNING THE PROGRAM, ENTER 'HELP', OR HIT
RETURN TO EXIT.
-->

*** END OF ORSER EXEC FILE ***
?

exec from men.u4100.gmb.lib#orsergo on vol005 clr
\$MEN.U4100.GMB.LIB NOT ON VOL005
EXEC FROM MEN.U4100.GMB.LIB#ORSERGO ON VOL005 CLR
ALTERS ? i0

WELCOME TO THE ORSER SYSTEM.
OK TO CLEAR ACTIVE FILE? ok
ENTER PROGRAM NAME OR 'HELP' FOR A DETAILED LIST OF INSTRUCTIONS.
ENTER 'LISTTAPES' TO LIST WORKING TAPES (RS TAPES) ASSIGNED TO YOU.
ENTER 'POLYGON' TO EXECUTE ANY ORSER POLYGON PROGRAM.
ENTER 'DATABASE' TO ACCESS THE PENNSYLVANIA LANDSAT DATABASE.
ENTER 'EXIT' TO EXIT THIS EXEC FILE.
-->database

WELCOME TO THE PENNSYLVANIA LANDSAT DATABASE.

LANDSAT DATA CAN BE RETRIEVED BY COUNTY NAME (C), BY FOREST DISTRICT (D),
 USER DEFINED POLYGON (U), OR BY PEST LOCATER GRID CELLS (P).
 ENTER THE TYPE OF AREA TO BE RETRIEVED (C/D/U/P) OR TYPE 'HELP' FOR
 MORE INFORMATION.

-->u

*** THE PENNSYLVANIA LANDSAT DATABASE ***

ACCESSING AREA BY USER DEFINED POLYGON

DATA CAN BE RETRIEVED BY LINE AND ELEMENT AREA CARDS OR BY UTM AREA
 CARDS. ENTER 'L' FOR LINE AND ELEMENT CARDS OR 'U' FOR UTM AREA CARDS
 OR 'HELP' FOR MORE INFORMATION

-->help

ACCESSING LANDSAT DATA BY USER DEFINED POLYGONS

THIS SECTION OF THE DATABASE ALLOWS THE USER TO SPECIFY A POLYGON
 BY AREA CARDS EITHER IN UTM COORDINATES OR IN LINE AND ELEMENTS
 (MEASURED FROM THE LANDSAT MOSAIC). THE USER WILL BE PROMPTED
 FOR THE DESIRED COORDINATE BASE (UTM OR LINE/ELEMENT) AND FOR
 THE COORDINATE PAIRS FOR EACH POLYGON VERTEX. NOTE ---> THE FULL
 UTM COORDINATES ARE TO BE GIVEN AT EACH PROMPT. HOWEVER THE VALUES
 WILL BE TRUNCATED TO THE NEAREST 10TH METER. FOR EXAMPLE, THE PAIR
 (4485837,590182) WILL APPEAR ON THE AREA CARD AS 'AREA 48584 59018'.
 THE LEADING 4 FOR THE NORTHING VALUE IS CONSTANT IN THE STATE AND
 IS OMITTED.

(HIT RETURN TO CONTINUE)

THE USER IS THEN PROMPTED FOR ADDITIONAL CONTROL CARDS, WHICH
 WOULD INCLUDE THE FOLLOWING : CHANNELS, END

THE USER IS NEXT PROMPTED FOR AN OUTPUT TAPE TO RECEIVE THE
 POLYGON DATA, AND FOR JOB OPTIONS. THE JOB STEM IS PLACED IN THE
 USER'S ACTIVE FILE, READY FOR SUBMISSION TO THE COMPUTER.

DATA CAN BE RETRIEVED BY LINE AND ELEMENT AREA CARDS OR BY UTM AREA
 CARDS. ENTER 'L' FOR LINE AND ELEMENT CARDS OR 'U' FOR UTM AREA CARDS
 OR 'HELP' FOR MORE INFORMATION

-->1

AREA CARD

ENTER LINE AND ELEMENT NUMBERS IN THE FORM -->LINE, ELEMENT.
 WHEN ALL COORDINATES HAVE BEEN ENTERED, HIT RETURN.

-->3000 3000

-->4000 3000

-->4000 4000

-->3000 4000

-->

ENDAREA CARD INCLUDED

IF ADDITIONAL CONTROL CARDS ARE DESIRED, TYPE CONTROL CARD NAME OR 'HELP' FOR A LIST OF APPLICABLE CARDS. WHEN ALL DESIRED CARDS HAVE BEEN INCLUDED, HIT RETURN.

-->

END CARD INCLUDED

GIVE THE OUTPUT SPECIFICATIONS AT THE NEXT PROMPT.

IS OUTPUT ON TAPE OR DISK? (T/D)

-->d

ENTER OUTPUT DATA SET NAME

-->MEN.P92250.FCL.subset

ENTER NUMBER OF TRACKS FOR DATA SET

NUMBER OF TRACKS = 1 + (#CHAN * #ELEM * #LINES) / 10000

-->24

* END OF POLYGON ACCESS METHOD *

ENTER JOB PARAMETER OPTION NUMBER(S) OR 'HELP' FOR A LIST OF OPTIONS. TO EXIT EXEC FILE, HIT RETURN.

-->

** ACTIVE FILE NOW CONTAINS STEM FOR RUNNING THE DATABASE PROGRAM **
FOR INFORMATION ON RUNNING THE PROGRAM, ENTER 'HELP', OR HIT RETURN TO EXIT.

-->

*** END OF ORSER EXEC FILE ***

? exec from man.u41000.gmb.lib#orsergo on vol005 clr

WELCOME TO THE ORSER SYSTEM.

OK TO CLEAR ACTIVE FILE? ok

ENTER PROGRAM NAME OR 'HELP' FOR A DETAILED LIST OF INSTRUCTIONS.

ENTER 'LISTTAPES' TO LIST WORKING TAPES (RS TAPES) ASSIGNED TO YOU.

ENTER 'POLYGON' TO EXECUTE ANY ORSER POLYGON PROGRAM.

ENTER 'DATABASE' TO ACCESS THE PENNSYLVANIA LANDSAT DATABASE.

ENTER 'EXIT' TO EXIT THIS EXEC FILE.

-->database

WELCOME TO THE PENNSYLVANIA LANDSAT DATABASE.

LANDSAT DATA CAN BE RETRIEVED BY COUNTY NAME (C), BY FOREST DISTRICT (D), USER DEFINED POLYGON (U), OR BY PEST LOCATER GRID CELLS (P).

ENTER THE TYPE OF AREA TO BE RETRIEVED (C/D/U/P) OR TYPE 'HELP' FOR MORE INFORMATION.

-->p

*** THE PENNSYLVANIA LANDSAT DATABASE ***

ACCESSING AREA BY THE PEST LOCATER GRID

ENTER THE LETTER FROM THE PA. HIGHWAY MAP OR ENTER 'HELP' FOR MORE INFORMATION

-->k

ENTER THE NUMBER FROM THE PA. HIGHWAY MAP

-->4

ENTER THE DESIRED QUAD NUMBER

-->3

GIVE THE OUTPUT SPECIFICATIONS AT THE NEXT PROMPT.

IS OUTPUT ON TAPE OR DISK? (T/D)

-->d

ENTER OUTPUT DATA SET NAME

-->MEN.P92250.FCL.k43

ENTER NUMBER OF TRACKS FOR DATA SET

NUMBER OF TRACKS = 1 + (#CHAN * #ELEM * #LINES) / 10000

-->10

IF ADDITIONAL CONTROL CARDS ARE DESIRED, TYPE CONTROL CARD NAME OR 'HELP' FOR A LIST OF APPLICABLE CARDS. WHEN ALL DESIRED CARDS HAVE BEEN INCLUDED, HIT RETURN.

-->

END CARD INCLUDED

ENTER JOB PARAMETER OPTION NUMBER(S) OR 'HELP' FOR A LIST OF OPTIONS. TO EXIT EXEC FILE, HIT RETURN.

-->

** ACTIVE FILE NOW CONTAINS STEM FOR RUNNING THE DATABASE PROGRAM **
FOR INFORMATION ON RUNNING THE PROGRAM, ENTER 'HELP', OR HIT RETURN TO EXIT.

-->

*** END OF ORSER EXEC FILE ***

? exec from men.u41000.gmb lib#orsergo on vol005 clr

WELCOME TO THE ORSER SYSTEM.

OK TO CLEAR ACTIVE FILE? ok

ENTER PROGRAM NAME OR 'HELP' FOR A DETAILED LIST OF INSTRUCTIONS.

ENTER 'LISTTAPES' TO LIST WORKING TAPES (RS TAPES) ASSIGNED TO YOU.

ENTER 'POLYGON' TO EXECUTE ANY ORSER POLYGON PROGRAM.

ENTER 'DATABASE' TO ACCESS THE PENNSYLVANIA LANDSAT DATABASE.

ENTER 'EXIT' TO EXIT THIS EXEC FILE.

-->nmapv

IS INPUT ON TAPE OR DISK (T/D)

-->d

ENTER INPUT DATA SET NAME

-->MEN.P92250.FCL.centre.west

ENTER THE LINE REPETITION FACTOR (UP TO 2 DIGITS, INTEGER FORMAT, OR ENTER 'HELP' FOR MORE INFORMATION).

-->help

THE SCALE OF THE FINAL OUTPUT MAP IS DETERMINED BY SEVERAL FACTORS. ONE OF THESE FACTORS IS THE REPETITION FACTOR FOR THE VERSATEC PLOTTER. THE VERSATEC PLOTTER CAN OUTPUT UPTO 4200 PIXELS WITH A REPETITION FACTOR OF 1, UPTO 2100 PIXELS WITH A REPETITION FACTOR OF 2, ETC. AT A REPETITION FACTOR OF 1 THE VERSATEC OUTPUTS 200 PIXELS TO THE INCH, WITH FACTOR OF 2, 100 PIXELS TO THE INCH, ETC.

THEREFORE, TO GET THE MAXIMUM PICTURE SIZE FROM THE VERSATEC, DETERMINE THE REPETITION FACTOR BY 4200 BY THE NUMBER OF ELEMENTS IN THE OUTPUT MAP, USING THE INTEGER PORTION AS THE FACTOR. THIS FACTOR MAY NOT YIELD THE BEST RESULTS AND SHOULD BE CHANGED AT THE USERS DISCRETION.

(HIT RETURN TO CONTINUE)

MOST OFTEN THE REPETITION FACTOR IS THE SAME FOR LINES AND ELEMENTS FOR SQUARE PIXELS. EITHER FACTOR CAN BE ADJUSTED TO COMPENSATE FOR RECTANGULAR PIXELS.

THE FOLLOWING TABLE HAS BEEN CONSTRUCTED FOR SQUARE PIXELS WITH A RESOLUTION OF 57 METERS (AS IN THE DATABASE PIXEL).

REPETITION FACTOR	MAXIMUM NUMBER OF ELEMENTS	SCALE
=====	=====	=====
1	4200	1:448,818
2	2100	1:224,409
3	1400	1:149,606
4	1050	1:112,205
5	840	1:89,764
6	700	1:74,803
7	600	1:64,117
8	525	1:56,102
9	466	1:49,869
10	420	1:44,882

(HIT RETURN TO CONTINUE)

THIS MAY SEEM A BIT CONFUSING ... THATS BECAUSE ITS VERY CONFUSING. ITS BEST TO SIT DOWN WITH A CALCULATOR AND FIGURE OUT WHAT YOUR REPETITION FACTOR AND CORRESPONDING SCALE WILL BE FOR YOUR PIXELS.

GOOD LUCK!!

ENTER THE LINE REPETITION FACTOR (UP TO 2 DIGITS, INTEGER FORMAT, OR ENTER 'HELP' FOR MORE INFORMATION).

-->2

ENTER THE ELEMENT REPETITION FACTOR

-->2

ENTER THE BACKGROUND GRAY SCALE LEVEL (FOR 'SUBBOUNDED' AREAS THE DEFAULT IS 0, UP TO 3 DIGITS IN INTEGER FORMAT)

--->255

IF ADDITIONAL CONTROL CARDS ARE DESIRED, TYPE CONTROL CARD NAME OR 'HELP' FOR A LIST OF APPLICABLE CARDS. WHEN ALL DESIRED CARDS HAVE BEEN INCLUDED, HIT RETURN.

- >help

CONTROL CARDS THAT MAY BE USED WITH THE NMAPV PROGRAM INCLUDE:

BLOCK
CHANNELS
CLASS
FLIGHT
LEVEL
MAP
NOMAP
PCTCLASS
RECAL
TITLE
END

ENTER NEXT CONTROL CARD NAME, 'HELP', OR HIT RETURN TO EXIT
-->

END CARD INCLUDED

ENTER JOB PARAMETER OPTION NUMBER(S) OR 'HELP' FOR A LIST
OF OPTIONS. TO EXIT EXEC FILE, HIT RETURN.
-->

** ACTIVE FILE NOW CONTAINS STEM FOR RUNNING THE NMAPV PROGRAM **
FOR INFORMATION ON RUNNING THE PROGRAM, ENTER 'HELP', OR HIT
RETURN TO EXIT.
-->

*** END OF ORSER EXEC FILE ***
? run unn
JOB 3109 MN2FCL04 IN JCL CONVERSION
? logon clr
3.89 SECONDS EDITING TIME
337 PAGE READS, 910 PAGE WRITES
310 DISK READS, 0 DISK WRITES
SESSION MNC16404, P92250, FCL OFF AT 16:27, \$000.76
ELAPSED TIME = 00:24:08
END OF SESSION

APPENDIX B: EXAMPLES OF VERSATEC OUTPUT

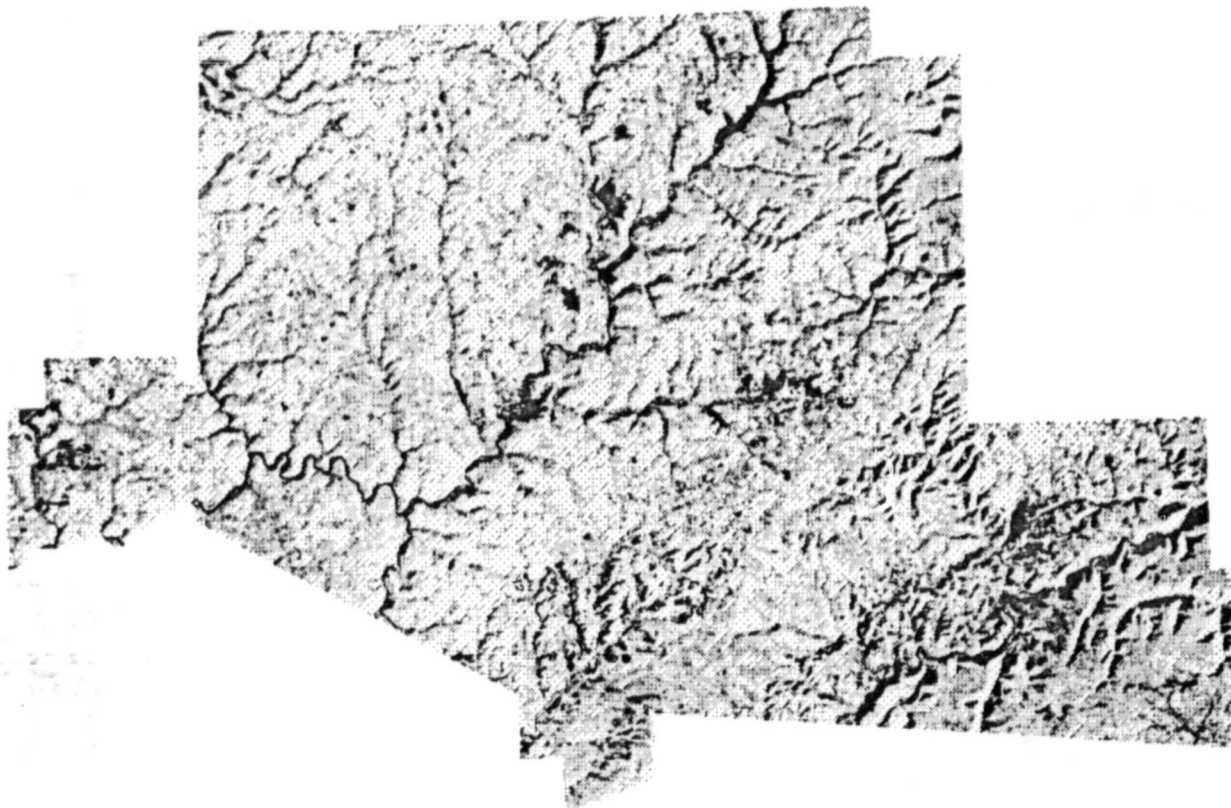
ORIGINAL PAGE
BLACK AND WHITE PHOTOGRAPH

ELK COUNTY SUBSET

NMAP (BRIGHTNESS MAP)
OF ALL FOUR BANDS

EIGHT UNIFORM PERCENT CLASSES

Scale 1:450,000



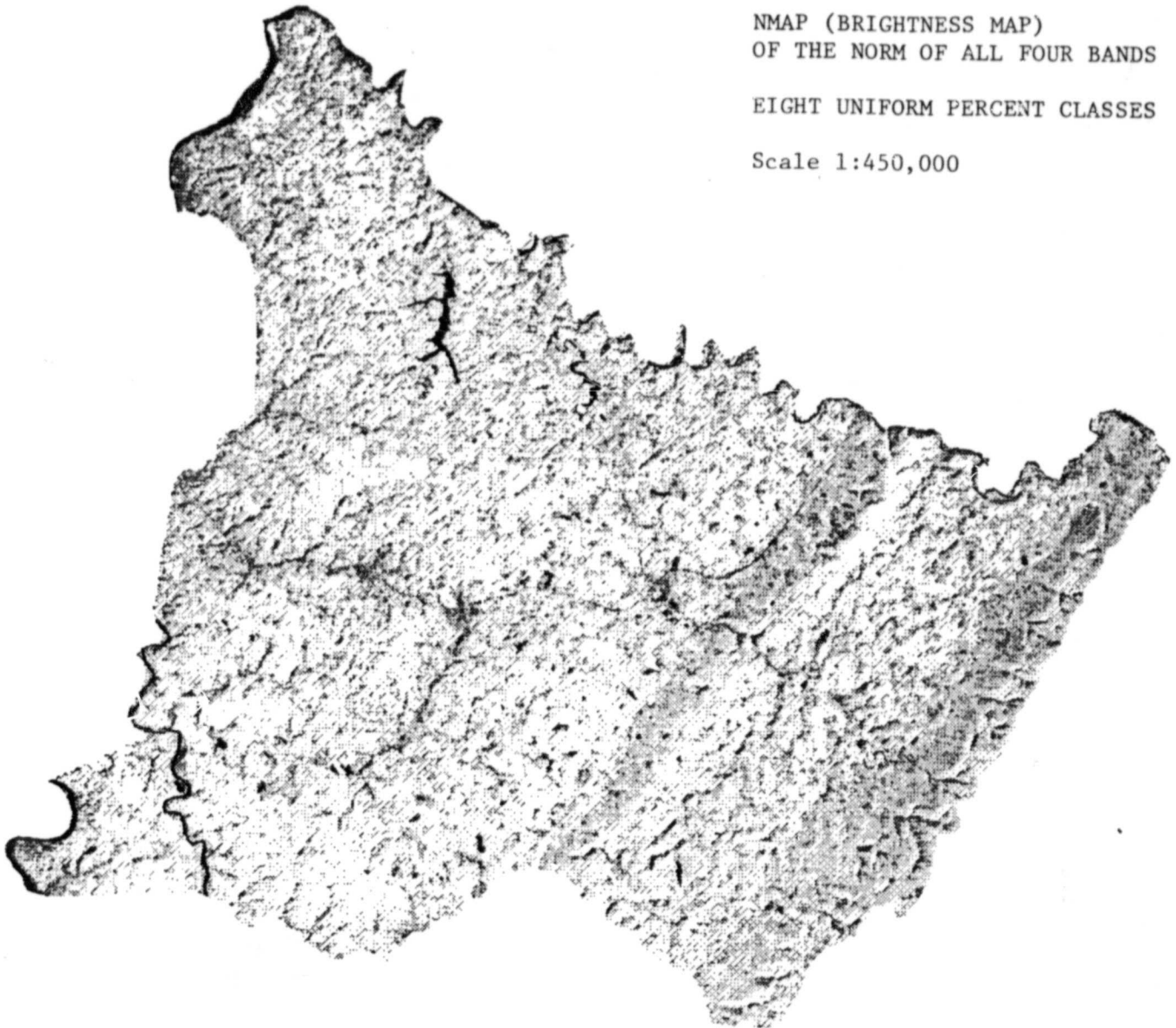
ORIGINAL PAGE
BLACK AND WHITE PHOTOGRAPH

WESTMORELAND COUNTY SUBSET

NMAP (BRIGHTNESS MAP)
OF THE NORM OF ALL FOUR BANDS

EIGHT UNIFORM PERCENT CLASSES

Scale 1:450,000



ORIGINAL PAGE
BLACK AND WHITE PHOTOGRAPH

FOREST DISTRICT 2 WEST SUBSET

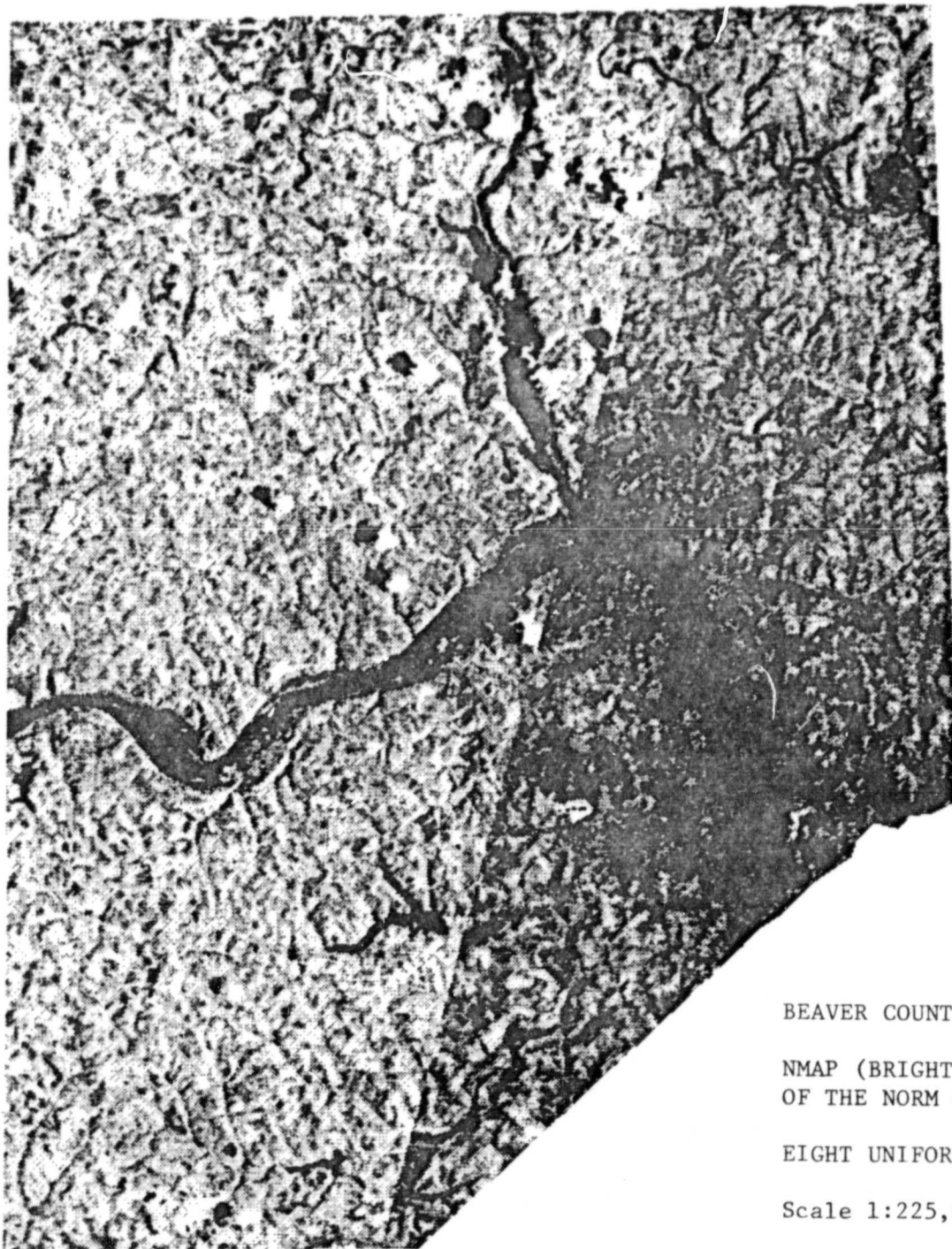
NMAP (BRIGHTNESS MAP)
OF THE NORM OF ALL FOUR BANDS

EIGHT UNIFORM PERCENT CLASSES

Scale 1:450,000



ORIGINAL PAGE
BLACK AND WHITE PHOTOGRAPH



BEAVER COUNTY SUBSET

NMAP (BRIGHTNESS MAP)
OF THE NORM OF ALL FOUR BANDS

EIGHT UNIFORM PERCENT CLASSES

Scale 1:225,000